

Amendment Under 37 C.F.R. § 1.111  
USSN 10/009,773  
PCT/IB00/00636  
Attorney Docket Q67442  
January 27, 2005

### **REMARKS**

Claims 1-10 are all the claims pending in the application.

By way of this amendment, Applicants submit herewith corrected Figure 5 in which reference numeral “36” has been changed to “46”. In addition, Applicants have amended the specification and the claims to address the matters raised by the Examiner in the Office Action. Thus, it is submitted that the objection to the drawings, objection to the Abstract of the Disclosure, objection to the specification and objection to the claims have been overcome. In addition, it is submitted that the §112 (second paragraph) rejection has been overcome. It is noted that Applicant’s have made additional changes to the claims in order to conform the claims to U.S. practice.

Claims 1, 3, 4, 6 and 10 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-9 of co-pending application 10/013,662 in view Lahne et al. (US Patent 4,339,413). Additionally, Claims 1, 3, 4, 6 and 10 have been provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1-11 of co-pending application 10/009,783 in view of Lahne et al. Claims 1-6, 9 and 10 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Ruppel et al. (EP 0 534 195). Still further, Claims 1-6, 9 and 10 have been rejected under 35 U.S.C. § 102(b) as being anticipated by Lahne et al. Finally, Claim 10 has been rejected under 35 U.S.C. § 102(b) as being anticipated by Brants (GB 1 270

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568). On the other hand, it is noted with appreciation that the Examiner has indicated that Claims 5 and 8 contain allowable subject matter.

For the reasons discussed below, the prior art rejections are respectfully traversed.

**Double Patenting Rejection**

The double patenting rejections are respectfully reverse traversed since the subject matter of independent Claims 1 and 10 is not rendered obvious by the combination of Application No, 10/013,662 (US 2002/0085969) with Lahne et al. (US 4,339,413) or the combination of 10/009,783 with Lahne et al.

None of the features recited in the wherein clauses of present Claim 1 are disclosed or suggested by Application Nos. 10/013,662 or 10/009,783.

The copending applications are directed to an isotherm reactor of substantially different structure, wherein the heat exchange tubes extend within the catalytic bed with a cone shaped helicoidal.

On the contrary, the heat exchange tubes of the present invention extend in the form of a spiral/coil arranged transversally to the shell axis, i.e, they extend on a plane. In other words, they are flat and thus cannot form a cone shaped configuration. The Examiner's assertion that a coil/spiral with a winding pitch that varies as the spiral radius varies would form a cone shaped helicoidal is groundless and technically incorrect. Such an assertion is also in clear contrast with the wording of present Claim 1 as well as with the text of the description; see for instance page 6, lines 24-27, page 13, lines 3-8 and line 19 to page 14, line 1.

Moreover, the heat exchange tubes housed in the catalytic bed according to the copending applications are not grouped in independent modular units, each of which including at least two tubes, and provided with respective connecting portions connected to corresponding feed and discharge collectors of the heat exchanger, as claimed in the characterizing portion of present claim 1.

The reactor disclosed in Lahne et al. is of totally different nature with respect to the claimed reactor. As can be seen from figure 1, the catalytic bed 4 is supported by the horizontal perforated plate 3 and is thus axially flown by the synthesis gas. The catalytic bed of the claimed reactor has on the contrary perforated cylindrical outer and inner side walls (4, 5) that allow a radial flow of the synthesis gas through the catalytic bed.

Moreover, the heat exchanger 5 arranged in the (axial) catalytic bed is made of a plurality of parallel tubes in the form of helical coils so as to obtain a helicoidal tube bundle which extends vertically from the bottom (in fluid communication with the coolant inlet 7) to the top (in fluid communication with the coolant outlet 8) of the catalytic bed.

In other words, the helical tube coils 21, 22 of Lahne et al. extend in the catalytic bed 4 along distinct vertical cylindrical surfaces, which are coaxial (parallel) to the shell axis (see for instance figures 2-6). There is no indication or teaching in this prior art document of a heat exchange tube in the form of a spiral/coil arranged transversally to the shell axis, i.e, of a flat tube configuration extending along a plane, as required in present Claim 1.

In Lahne et al., the tubes are not superimposed (as in Claim 1) but disposed the one beside the other as shown in figure 6. At column 4, lines 48-49 it is clearly stated that the coils are separated by a radial spacing. It follows that the helical coils 21 and 22 according to Lahne et al. extend along respective concentric cylindrical surfaces of different diameter. Moreover, the tubes are not arranged in structurally independent modules, each including at least two tubes (as in claim 1).

Manifolds 7a and 8a in Lahne et al., are indeed a feed and a discharge collector, respectively, of the heat exchanger 5, to which each individual helical tube is directly connected (see for instance Lahne et al., column 4, lines 8-15 and 37-39, figures 1 and 6, tubes sections 23, 24). According to the present invention, the modules and not the single tubes are connected to such collectors through respective connecting portions 22, 23. The manifolds 7a and 8a of Lahne et al. can thus in no way be compared or confused with the module connecting portions according to the present invention.

With reactor according to Lahne et al., the tubes lie transverse to the direction of the synthesis gas flow (see for instance column 4, lines 52-54), while on the contrary thanks to the present invention the tubes are advantageously arranged in a substantially parallel way with respect to the reactants flow (see for instance description, page 6, lines 28-30).

The Examiner assertion that the helical tubes disclosed in Lahne et al. are superimposed and extend along a horizontal plane that is substantially perpendicular to the catalytic bed side

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walls, is respectfully traversed as being the result of an inaccurate analysis of the prior art document.

The above arguments also apply for the subject-matter of present Claim 10.

The obviousness-type double patenting rejection should thus be regarded as unfounded.

#### **Claims Rejections - 35 U.S.C. § 102**

With respect to the § 102 rejection based on Ruppel et al., ((EP-A-0 534 195), figures 1 and 2 and the abstract), Applicants respectfully request reconsiderations since the Examiner's position is not based on a correct comparison between the actual disclosure of Ruppel et al. and the claimed reactor.

None of the features recited in the characterizing portion of present Claim 1 are disclosed or suggested in Ruppel et al.

This document discloses a heat exchanger in the form of a helicoidal tube bundle of the same type of that shown in Lahne et al. and thus reference is made to the observations set forth above in connection with Lahne et al.

In particular, in Ruppel et al., each single tube is wrapped along the catalytic bed with a predetermined slope, so that the tube vertically extends in the catalytic bed with helicoidal arrangement as clearly shown in the figures; that is along a respective cylindrical surface parallel

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to the shell axis. This is in clear contrast with the reactor according to present Claim 1, wherein the tubes in the modular unit are arranged transversally, i.e. perpendicularly, to the shell axis.

Ruppel et al. clearly shows that each single tube has to be connected independently to the feed and discharge collectors of the heat exchanger. Therefore, a hypothetical unit made of a plurality of tubes cannot be provided, according to Ruppel et al., with respective connecting portions to said feed and discharge collectors, as recited in present Claim 1.

In Ruppel et al. the tubes are concentric, i.e. the tubes lay one beside the other in the annular space of the catalytic bed as a plurality of cylinders of different radius, extending throughout the catalytic bed, from the bottom to the top. On the contrary, according to Claim 1, the tubes are arranged in group of at least two tubes in modular units which are structurally independent and superimposed one above the other. The tubes of each module extend in a flat spiral/coil configuration along a plane arranged transversally to the shell axis and thus they do not extend from the bottom to the top of the catalytic bed as disclosed in Ruppel et al.

In other words, according to Ruppel et al, the tubes are crossed in series by the radial flow of reactants flowing in the catalytic bed, while according to the present invention the tubes in the modular units are advantageously crossed in parallel by such reactant radial flow.

This prior art document is indeed equivalent to DE-A 3 318 098 cited in the prior art section of the present application and thus it should be considered as mere prior art as defined in the preamble of present Claim 1.

The same arguments also apply to independent Claim 10.

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Thus, the subject-matter of Claims 1 and 10 should be considered patentable over Ruppel et al.

The Examiner considers the subject-matter of present Claims 1 and 10 not new in view of Lahne et al. In this respect, reference is made to the observations set forth above in connection with the double patenting rejections.

The Examiner considers the subject-matter of present Claim 10 not new in view of Brants (GB-A-1 270 568). The new wording of Claim 10 clearly and unambiguously distinguishes the claimed modular unit from the modular unit disclosed in Brants.

In fact, each tube or coil in the heat exchange unit of Brants is wrapped with helical arrangement as clearly shown in the figures and in the description at page 1, line 53; that is along a respective cylindrical surface parallel to the unit axis. On the contrary, in the unit according to present Claim 10 the tubes are arranged transversally, i.e. perpendicularly; to the unit axis.

Thanks to the present invention it is possible to obtain a unit with a high heat exchange coefficient, to all advantage of the conversion yield and of the energy consumption of the reactor housing such a unit (see also present description, page 6, line 24 to page 7, line 14). The unit of Brants, if placed in a catalytic bed of a chemical reactor, will instead suffer of the same drawbacks of the tube bundle disclosed in Ruppel et al., as set forth in the prior art section of the present description.

The subject-matter of Claim 10 should thus be considered patentable over Brants.

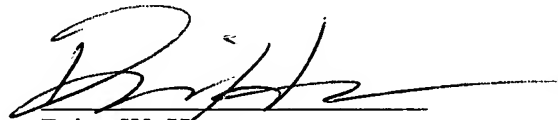
In view of the above arguments, allowance of the present case is expected.

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If for any reason the Examiner is unable to allow the application on the next Office Action and feels that an interview would be helpful to resolve any remaining issue, the Examiner is respectfully requested to contact the undersigned attorney for the purpose of arranging such an interview.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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23373

CUSTOMER NUMBER

Date: January 27, 2005



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**AMENDMENTS TO THE DRAWINGS**

Annotated Figure 5 is submitted herewith changing reference numeral 36 to 46 as amended in the specification.

Attachment: Annotated Sheet containing Figure 5